REMARKS

Claims 8-34 are currently pending in the above application. Claims 35-40 are added by this amendment.

Claim 16 stands objected to because the claim does not end in a period. Applicants respectfully agree, and have added a period at the end of the claim.

Claims 8 and 25 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Tate (Japanese Patent No. 61035868) in view of Potter et al. (U.S. Patent No. 5,783,261) and further in view of Malaczynski et al. (U.S. Patent No. 5,458,927). Claims 16, 22, 25, 33, 34 stands rejected under 35 U.S.C. 103(a) as being obvious over Naik (U.S. Patent No. 4,919,773) in view of Tate (U.S. Patent No. 6,093,869). Claims 23 and 31 stand rejected under 35 U.S.C. 103(a) as being obvious over Naik (U.S. Patent No. 4,919,773) in view of Tate and further in view of Tate (U.S. Patent No. 4,902,535). Claims 9-15, 17-21, 24, 26-30 and 32 are objected to as being dependent upon a rejected base claim, but indicated as being allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claim.

Regarding the Examiner's rejection of claims 8 and 25 under 35 U.S.C. 103(a), Applicants respectfully traverse the Examiner's rejections. As the Examiner indicates, Tate describes a nitride hardening surface treatment for an aluminum rotary atomizer in order to improve abrasion resistance. As one of ordinary skill in the art recognizes, a nitride hardening treatment is not the equivalent of a wear resistant coating applied to an outer surface. A nitride hardening treatment involves a two-step process. First, the outer surface is reacted with hydrogen in an oxygen free environment. After the hydrogen exposure, nitrogen ions react with the surface of the aluminum to form chemical bonds with the aluminum. A nitride hardening treatment is thus best described as a surface modification treatment.

Applicants further would like to bring to the Examiner's attention that a Supplemental Information Disclosure Statement is being filed herewith listing U.S. Patent No. 4, 597,808, to Tachikawa et al., entitled "Process for Ion Nitriding Aluminum or Aluminum Alloys". This prior art reference discloses a surface treatment method for improving wear resistance of aluminum material.

Potter et al. describes a method of using a coated fuel injector to extend the operating life of the steel surfaces of a fuel injector. Potter does describe a degreasing step prior to an etching and coating step of a steel surface of a needle and valve that includes the use of soap, potassium hydroxide and water acetone rinse, a nitric acid etch and alcohol. Potter does not describe an atomic cleaning step as part of the preparation of the outer surface of the part prior to coating. Potter is also not used on aluminum or titanium surfaces.

Malaczynski et al. describes a process for forming a diamond-like carbon coating on a workpiece, preferably automobile components such as pistons, and includes successive immersion steps in different plasma atmospheres to clean the surface of oxygen atoms. Malaczynski then implants a carbide compound while codepositing a carbonaceous layer on the surface, bombards and removes the carbonaceous layer, and to thereafter deposits an amorphous hydrogen containing carbon layer. Malaczynski does not teach a step of preparing the outer surface including a cleaning, etching, and rinsing step prior to an atomic cleaning step. Malaczynski also requires an implantation of a carbide compound step and codepositing of a carbonaceous layer prior to the argon bombardment step that the present invention does not require.

The present invention is substantially different than the Tate reference. First, as the Examiner acknowledges, Tate does not teach the preparation of the outer surface for treatment as in claims 8 and 25. Further, claims 8 and 25 require a wear resistant

coating applied to a prepared outer surface of an aluminum bell cup (claim 8) or to a prepared outer surface of the spray application equipment (claim 25). As one of ordinary skill in the art recognizes, a wear resistant coating is not the equivalent of a nitride hardening treatment. A wear resistant coating does not modify the outer surface like a nitride hardening treatment, but instead adds an additional protective layer onto the outer surface. Because Tate does not disclose a wear resistant coating applied to a prepared surface, Tate cannot anticipate claims 8 and 25. Further, because Tate forms an abrasion resistant surface without the need for an additional coating, there is no reason why one of ordinary skill would combine Tate with Potter and further with Malaczynski to arrive at the present invention. As such, the present invention, as in claims 8 and 25, is non-obvious in view of the cited prior art. Reconsideration of independent claims 8 and 25, and dependent claims 9-15 and 26-34, is respectfully requested.

Regarding the Examiner's rejection of claims 16, 22, 25, 33 and 34 to Naik in view of Tate, Applicants respectfully traverse the Examiner's rejection. As the Examiner indicates, Naik discloses a method for improving the erosion resistance of metallic substrates by first applying a layer of group VI to group VIII or a noble metal (which includes chromium) followed by a layer of a boride, carbide, oxide, or nitride of a metal selected from a Group III to IV element. The Naik reference also teaches the steps of cleaning the surface with detergent, an acidic solution or an alkaline solution.

The present invention, as in modified claim 16, does not utilize a boride, carbide, oxide, or nitride of a metal of a Group III to IV element as a wear resistant coating, nor does it add this wear resistant coating layer to a group VI or VII layer, as in the Naik reference. Instead, it adds a wear resistant coating, preferably carbon based wear resistant coating and more preferably a silicon–doped amorphous carbon coating, coupled to an adhesion promoter material, preferably chrome. Thus, modified claim 16 is novel, notwithstanding the Naik reference. Tate, as described above, does not teach a

wear resistant coating but instead teaches a nitride hardening treatment. As such, claim 16 is not taught by the combination of Naik and Tate. As such, claim 16 is not obvious over Naik in view of Tate. Reconsideration of claim 16, and dependent claims 17-24, is therefore respectfully requested.

Similarly, claim 25 does not utilize a boride, carbide, oxide, or nitride of a metal of a Group III to IV element as a wear resistant coating as is required in the Naik reference. Tate, as described above, does not teach a wear resistant coating but instead teaches a nitride hardening treatment. As such, claim 25 is not taught by the combination of Naik and Tate. Reconsideration of claim 25, and dependent claims 26-34, is respectfully requested.

Regarding the rejection of claims 23 and 31, Applicants respectfully traverse the Examiner's rejection. As the Examiner indicates, Garg teaches the introduction of silane and methane a chamber at a pressure of 1 Torr to form a coating on a noble metal intermediate interlayer that is coupled to a titanium alloy. The present invention, as described in claims 23 and 31, claim the introduction of hydrocarbons and silicon-doped hydrocarbons (such as tetramethylsilane). As one of ordinary skill appreciates, a silicon-doped hydrocarbon such as tetramethylsilane is not the same as silane. Further, claim 31 does not require a titanium alloy surface. Thus, claims 23 and 31 are novel, notwithstanding the Garg reference. As neither Naik nor Tate nor Garg describe the introduction of a silicon-doped hydrocarbon to an outer surface, claims 23 and 31 are not taught by the combination of Naik, Tate, and Garg. Reconsideration of claims 23 and 31 is thus respectfully requested.

Claims 35-40 are added by the foregoing amendment. Applicants respectfully submit that a wear resistant carbon coating and a silicon-doped amorphous carbon coating as a particular type of wear resistant coating are fully supported by the original

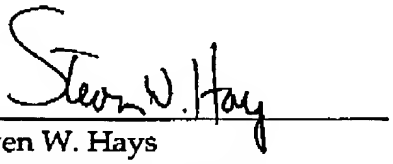
specification and as such do not constitute new matter. Consideration of claims 35-40 is thus respectfully requested.

The Commissioner is authorized to charge any additional claim fees, which may be required, or credit any overpayment, to Deposit Account No. 06-1510 or 06-1505 in the name of Ford Global Technologies, L.L.C.

The Examiner is invited to telephone the Applicant's undersigned attorney at (248) 223-9500 if any unresolved matters remain.

Respectfully submitted,

ARTZ & ARTZ, P.C.



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In The Claims:

Please amend claim 16 as follows:

16. (Amended) A method for improving wear resistance of the outer surface of a titanium bell cup, the method comprising the steps of:

preparing the outer surface of the titanium bell cup; and

applying an adhesion promoter coating to the outer surface;

applying a wear resistant coating to the adhesion promoter coating.

Please add new claims 35-40 as follows:

35. (New) The method of claim 8, wherein applying a wear resistant coating to said outer surface comprises applying a wear resistant carbon coating to said outer surface.

36. (New) The method of claim 35, wherein applying a wear resistant coating to said outer surface comprises applying a silicon-doped amorphous carbon coating to said outer surface.

37. (New) The method of claim 16, wherein applying a wear resistant coating to the adhesion promoter coating comprises applying a wear resistant carbon coating to the adhesion promoter coating.

38. (New) The method of claim 37, wherein applying a wear resistant carbon coating to the adhesion promoter comprises applying a silicon-doped amorphous carbon coating to the adhesion promoter coating.

39. (New) The method of claim 25, wherein applying a wear resistant coating to said outer spraying surface comprises applying a wear resistant carbon coating to said outer spraying surface.

40. (New) The method of claim 39, wherein applying a wear resistant carbon coating to said outer spraying surface comprises applying a silicon-doped amorphous carbon coating to said outer spraying surface.